



RAILROAD COMMISSION OF TEXAS

SURFACE MINING AND RECLAMATION DIVISION

January 11, 2018

Sent by Email

Mr. Tommy E. Hodges
Energy Manager
Alcoa
P. O. Box 1491
Rockdale, Texas 76567-1491

RE: Alcoa USA Corp. (Alcoa)
Sandow Mine, Permit No. 1G
South Haul Road Corridor Ground-Cover Evaluation: 580.7 Acres

Dear Mr. Hodges:

Review of Alcoa's ground-cover evaluation for the 580.7-acre South Haul Road Corridor at Sandow Mine, submitted by letter dated December 21, 2017, is complete. The report was submitted in anticipation of release of reclamation liability on 580.7 acres of industrial/commercial (I/C) and developed water resources (DWR) land-use areas.

The I/C area surveyed for ground cover is approximately 537.7 acres within the anticipated release area. According to §12.395(b)(4), vegetative ground cover for areas in I/C land use shall not be less than that required to control erosion.

Alcoa's, I/C ground-cover estimate of 96.0% exceeds 90% of the performance standard for this area, as required at §12.395(a)(2). This indicates that permanently established vegetative ground cover within the 580.7-acre area has been successful and is adequate to control erosion, as required at §12.313(a)(2), §12.390(a) and (b), and §12.395(b)(4). Staff's review of this report is described in the enclosed memorandum.

Should you have any questions please contact me or Marian Farmmer-Kumassah, project coordinator, for this review.

Sincerely,

A handwritten signature in blue ink, reading "Travis L. Wootton".

Travis L. Wootton, Assistant Director
Surface Mining and Reclamation Division

TLW/MFK/rv
Enclosure
File Reference No. 1735602



RAILROAD COMMISSION OF TEXAS

SURFACE MINING AND RECLAMATION DIVISION

MEMORANDUM

TO: Travis L. Wootton, Assistant Director *TLW*

THRU: Timothy G. Walter, P.G., Manager, Applications and Permits *TGW*

FROM: Marian Farmmer-Kumassah, Natural Resources Specialist

SUBJECT: Alcoa USA Corp. (Alcoa)
Sandow Mine, Permit No. 1G
South Haul Road Corridor Ground-Cover Evaluation: 580.7 Acres

DATE: January 11, 2018

INTRODUCTION

Alcoa submitted the subject report by letter dated December 21, 2017. The report contains results of ground-cover evaluation on a 537.7-acre parcel of postmine industrial/commercial (I/C) land, which is part of the 580.7-acre South Haul Road Corridor at the Sandow Mine. The report was submitted in anticipation of release of reclamation liability on 580.7 acres of industrial/commercial(I/C) and developed water resources (DWR) land-use areas. Rules §12.313(a)(2), §12.390(a) and (b), and §12.395(b)(4) require that permanently established vegetative ground cover in I/C areas be adequate to control erosion prior to Phase II and/or III release. The area surveyed is shown on Alcoa's Exhibit Sheets 1, 2 and 3, *2017 Ground Cover Evaluation, Proposed 580.7 Acre Bond Release*. Review of submittal is presented below.

REPORT SUMMARY

Areas sampled

1. The I/C portions (approximately 537.7 acres) of the South Haul Road Corridor was sampled for ground-cover evaluation.
2. On Exhibit Sheets 1-3, Alcoa depicts the permit boundary, 580.7-acre anticipated bond release boundary, I/C and DWR land-use areas, and sample sites (identified by GPS IDs).

Methodology

1. Ground-cover data were collected on May 2, 2017. A total of 100 ground-cover measurements were obtained using the random point-intercept method described in the Commission guidance document entitled, *Procedures and Standards for Determining Revegetation Success on Surface-Mined Lands in Texas* (Procedures and Standards).
2. Alcoa provided the ground-cover data, per hit, in Section 5, Appendix A, *Ground Cover and Diversity Data*.

3. Pastureland ground-cover standards were used for assessing revegetation success on the I/C land-use area.

Results

Table 1 below shows the standards and sampling results presented by Alcoa.

Table 1: Vegetative Ground-Cover Standards and Estimates

Acres	Cover Standard	90% of the Standard (LAV)	Cover Estimate	Maximum Error
537.7	92.2%	83.0%	96.0%	3.4%

PROPOSAL EVALUATION

1. The 580.7-acre South Haul Road Corridor consists of 537.7 acres of industrial/commercial(I/C) land use with the remaining being developed water resources (DWR). The land uses are depicted on map Sheets 1, 2 and 3 and are consistent with Revision No. 68, Plates 147-1, *Postmine Land Use*, approved on December 12, 2017.
2. The sampling locations are appropriately shown on Alcoa's Exhibit Sheets 1-3 (*2017 Ground Cover Evaluation, Proposed 580.7 Acre Bond Release*).
3. Alcoa indicated that the species within the I/C unit area were planted from 1952 to 2009. Species identified in the ground-cover inventory data in Appendix A are included in the approved species list for the Sandow Mine.
4. The random-point sampling method used by Alcoa to evaluate groundcover is consistent with the Procedures and Standards. There were 100 ground cover observations out of the 100 measurements, with no misses (i.e. 100% ground cover). However, 29% were approved invaders and exceeded the 25% limit of invaders allowed. Therefore, Alcoa deducted 4% from the ground cover, resulting in ground cover estimate of 96%.
5. The ground-cover standard was based on pastureland standards calculated using 95% cover for sod grasses and 90% cover for bunch grasses. As shown in Section 3.1, *Ground Cover*, 20 out of the 45-grass species observed were sod-forming grasses while the other 25 grass species were bunch grasses. Alcoa therefore arrived at a weighted calculated ground cover standard of 92.2%.
6. Based on Table 1, *Vegetative Ground-Cover Standards and Estimates*, above, the ground cover estimate of 96% exceeds the 92.2% cover standard as well as the lowest acceptable value of 83% (i.e. 90% of the success standard).
7. The sample adequacy calculation showed that the number of samples collected for ground cover was statistically adequate because the maximum error relative to the mean (3.4%) was equal to or less than 10% (Appendix C *Statistical calculations*).
8. According to §12.395(b)(4), vegetative ground cover for areas in I/C land use shall not be less than that required to control erosion. Alcoa compared ground cover estimates in the I/C area to higher

standards for pastureland. This indicates that vegetative ground-cover in the I/C land-use area is sufficient to control erosion.

CONCLUSIONS AND RECOMMENDATIONS

Alcoa's sampling methodology is in accordance with specifications of the referenced Commission guidance document. The data presented indicate that vegetative ground cover has been successfully established and is adequate to control erosion, as required at §12.313(a)(2), §12.390 (a) and (b), and §12.395(b)(4).

Please contact me with questions regarding this review.



Marian Farmmer-Kumassah

MFK/rv
File Reference No. 1735602



Alcoa Primary Metals
Energy Division-Sandow Mine
3990 John D. Harper Road
PO Box 1491
Rockdale, TX 76567-1491 USA

December 21, 2017

J. Denny Kingsley, P.E., Director
Surface Mining and Reclamation Division
Railroad Commission of Texas
P.O. Box 12967
Austin, Texas 78711-2967

Railroad Commission
of Texas
RECEIVED

DEC 22 2017

Surface Mining Division

RE: Alcoa USA Corp.
Sandow Mine, Permit No. 1G
2017 Ground Cover Evaluation on 580.7-Acre Phase I, II & III Bond Release
Industrial/Commercial Land Use
Alcoa Document Number 2017- 69

Dear Mr. Kingsley:

Alcoa USA Corp. (Alcoa) is providing the report entitled "2017 Ground Cover Evaluation on 580.7-Acre Phase I, II & III Bond Release Industrial/Commercial Land Use" to demonstrate that ground cover is adequate to control erosion within the vegetated portions of the I/C land use areas in accordance with the Commission guidance document, *Procedures and Standards for Determining Revegetation Success on Surface-Mined Lands in Texas*. The findings that the ground cover is adequate to control erosion, based on Pastureland standards, are summarized in the Conclusions.

A CD containing the data files and an AutoCAD file is included for your reference.

If you have any questions or concerns, or if you require any additional information, please do not hesitate to call me at (512) 446-8419.

Respectfully,

Tommy E. Hodges, P.E.
Alcoa USA Corp
Rockdale Operations
Energy Manager
Attachments

**SANDOW MINE
PERMIT 1G
2017 GROUND COVER EVALUATION ON
580.7-ACRE PHASE I, II & III BOND RELEASE
INDUSTRIAL/COMMERCIAL LAND USE**

Prepared for:

ALCOA USA CORP.
ROCKDALE, TEXAS

Prepared by:

HF & ASSOCIATES, INC.
SAN ANTONIO, TEXAS

DECEMBER 2017

TABLE OF CONTENTS

<u>SECTION</u>		<u>PAGE NO.</u>
1.0	INTRODUCTION	1-1
2.0	METHODOLGY	2-1
	2.1 Ground Cover	2-1
	2.2 Statistical Analysis/Sample Adequacy	2-1
3.0	RESULTS	3-1
	3.1 Ground Cover	3-1
	3.2 Statistical Analysis/Sample Adequacy	3-2
4.0	CONCLUSIONS	4-1
 <u>TABLE NO.</u>		
1	Sandow Mine 2017 Sample Unit	1-1
 <u>APPENDICES</u>		
A	Ground Cover & Diversity Data	
B	Statistical Calculations	
 <u>EXHIBIT NO.</u>		
1	580.7 Acre Proposed Bond Release Ground Cover	

1.0 INTRODUCTION

This report details the 2017 ground cover evaluation on 580.7-acre Phase I, II, & III bond release area along the South Haul Road Corridor of the Sandow Mine. The land uses in this bond release area are Industrial/Commercial (I/C) and Developed Water Resource (DWR). This ground cover study was conducted to satisfy the requirement for a Phase III bond release. Table 1 below provides detailed information for the unit evaluated in this report.

Table 1. Sandow Mine 2017 Sample Unit

<u>Mine Area</u>	<u>Land Use</u>	<u>Acres</u>	<u>Planted</u>	<u>Approved Permit</u>
South Haul Road Corridor	I/C	537.7	1952-2009	Pre-law to 1F

2.0 METHODOLOGY

The methodologies utilized to gather and analyze all data within this report were those specified in the Procedures and Standards for Determining Revegetation Success on Surface-Mined Lands in Texas (Procedures), by the Railroad Commission of Texas (RCT, 2014) for Pastureland land use.

2.1 Ground Cover

Ground cover sampling was conducted using the random point method. Utilizing the “Create Random Points” function of ArcMap 9.2, random points were generated within the defined sample area. Total data points for the proposed I/C bond release area evaluated was limited to the allowable maximum of (125) and minimum of (75) as stated in the Procedures. Sampling took place on May 5, 2017. Sample sites were located utilizing a Global Positioning System (GPS) unit. Once located, a sighting device with cross hairs for making point-intercept ground cover observations was utilized to accurately evaluate ground cover. Exhibit 1 provides the locations of each sample point for this evaluation and identifies each on the map by GPS ID. Findings from the field evaluations are provided in Appendix A “Ground Cover & Diversity Data”.

Intercepts of permit approved species, approved invaders, and litter were considered hits. Intercepts of non-permit approved species and bare ground were considered misses. Intercepts with rocks > .75 inches were not counted as observations for cover evaluation. Ground cover was calculated by dividing the total number of permit-approved species, approved invader species (up to 25%), and litter (up to 15%) by the total number of observations made.

Ground cover standards for Pastureland were used to determine successful revegetation for I/C land use. Cover standards for Pastureland were calculated using 95% cover for sod grasses and 90% cover for bunch grasses as stated in Procedures. The weighted standard was derived from the percent of each type of grass multiplied by its respective standard. Ground cover is compared to the weighted standard and must achieve 90% of the standard which is the lowest acceptable value (LAV) to be considered successful.

2.2 Statistical Analysis/Sample Adequacy

Statistical calculations to determine if an adequate number of samples were collected for this evaluation were performed as required in the Procedures. All statistical calculations are provided in section 3.2 of this report.

Ground Cover

To determine sample adequacy for ground cover (GC), a 10% maximum error (ME) related to the mean was calculated using the following equation:

$$(ME) = [(t\text{-value} \times \text{Standard Error}) \div \text{GC Estimate}] \times 100$$

The t-value utilized was selected for a two-sided test with a 90% confidence.

To obtain standard error (SE), the following equation was utilized:

$$(SE) = \sqrt{(\text{GC Estimate} (100 - \text{GC Estimate}) / \text{number of recordable samples taken})}$$

Confidence intervals are used when the ground cover of a reclaimed area is compared to a technical standard as a measure of revegetation success. The confidence interval for a ground cover estimate is required when the estimate is less than the lowest acceptable value (90% of the technical standard).

To obtain the one sided confidence interval (CI), the following equation was utilized:

$$\text{One Sided Confidence Interval} = \text{GC} + [t \times \text{SE}]$$

Where:

GC = percent ground cover

t = t-value utilized was selected for a one-sided test with a 90% confidence

SE = standard error of the estimated ground cover

3.0 RESULTS

The area surveyed for ground cover is the 537.7 acres of I/C land use within the 580.7-acre proposed bond release area. The ground cover in the proposed bond release area consists of warm season perennial grasses, forbs, and trees. The area was observed to be stable throughout. Based on the field observation, the area had no erosion sufficient to hinder the land use.

3.1 Ground Cover

The following summary consists of data presented in their entirety within Appendix A.

580.7-acre Bond Release Area – I/C Land Use

Total Measurements:	100
Hit:	100
Miss:	0
Non-recordable:	0

Cover Summary

Tifton-85 Bermudagrass:	5 out of 100
Coastal Bermudagrass:	15 out of 100
Old World Bluestem:	16 out of 100
Switchgrass:	8 out of 100
Other Grasses:	1 out of 100
Forbs/Vines:	2 out of 100
Woody Species:	11 out of 100
Approved Invaders:	29 out of 100
Litter:	13 out of 100
Bare Ground:	0 out of 100
Non-permitted Species:	0 out of 100
Rock/Water:	0 out of 100

Estimated Cover: **96.0%**

Pastureland Cover Standard:

Sod grass: $20/45 \times 95\% = 42.2\%$

Bunchgrass: $25/45 \times 90\% = 50.0\%$

92.2%

Lowest Acceptable Value: **83.0%**

Approved invaders make up 29.0% of the recordable observations. This exceeds the allowable 25% by 4%. Therefore, 4% is considered as a miss and deducted from the ground cover percentage.

3.2 Statistical Analysis/Sample Adequacy

Ground Cover:

To measure the sample adequacy for ground cover, a 10% maximum error (ME) related to the mean was calculated. Statistical calculations are presented in Appendix B.

Study Area Maximum Error: $[(1.662 \times 1.96) / 96.0] \times 100 = 3.4\%$

4.0 CONCLUSIONS

This report details the 2017 ground cover evaluation on 537.7 acres of Industrial/Commercial (I/C) land use in 580.7-acre South Haul Road Corridor of the Sandow Mine. This ground cover study was conducted to satisfy the requirement for a Phase III bond release. Methodologies used for sampling and data analysis were those specified in the Procedures for Pastureland land use.

The ground cover standard was 92.2%; the lowest acceptable value (90% of 92.2%) was 83.0%. The area was observed to be stable throughout. Based on the field observation, the area has no erosion sufficient to hinder the land use. Ground cover for the 537.7-acre I/C land use was estimated to be 96.0%.

Maximum error for the ground cover data was 3.4%. Since the ground cover exceeded the ground cover standard LAV for Pastureland, it was not necessary to calculate the confidence interval.

Appendix A: Ground Cover & Diversity Data

Ground Cover Inventory

Date: 2-May-17										Location: 580.7-ac Bond Release Area									
Mine: Sandow										Land Use: Industrial/Commercial									
Inventoried by: T. Feuerbacher																			
Sample Number	GPS Point	Tifton 85 Bermuda	Coastal Bermuda	Common Bermuda	Klein Grass	Old World Bluestem	Switch Grass	Wilman Love	Sideoats Grama	Indian Grass	Other Grasses	Forbs & Vines	Woody Species	Approved Invaders	Litter	Miss		Rock Water	
																BG	NPS		
1	28													J					
2	83													J					
3	92													ERW					
4	38													J					
5	84													WB					
6	95													WB					
7	87													J					
8	45														X				
9	4													ERW					
10	67													J					
11	77						X												
12	53													J					
13	97														X				
14	19	X																	
15	58												GA						
16	59													J					
17	65													J					
18	3													J					
19	24													J					
20	51		X																
21	78													J					
22	27												MES						
23	100						X												
24	56		X																
25	9						X												
26	5													WRW					
27	29													J					
28	82													J					
29	16													J					
30	54													J					
31	85													J					
32	52														X				
33	42					X													
34	48											DB							
35	12												BL						
36	46														X				
37	40														X				
38	10						X												
39	1												CE						
40	32													J					
41	18													J					
42	21														X				
43	64												PO						
44	88												PO						
45	76					X													
46	94					X													
47	6					X													
48	33					X													
49	25					X													
50	69														X				

J=Johnsongrass, WB=Willow Baccharis, ERW=Eastern Ragweed, GA=Green Ash, MES=Honey Mesquite, DB=Dewberry, BL=Black Locust, CE=Cedar Elm, PO= Post Oak, WRW=Western Ragweed, MSF=Maximillian Sunflower, LO=Live Oak, TH=Thistle, SBS=Silver Bluestem

Other = Various permitted grass species which may have been planted or volunteered into the area. BG = Bare Ground, NPS = Non-permitted species.

Ground Cover Inventory

Date: 2-May-17		Location: 580.7-ac Bond Release Area																	
Mine: Sandow		Land Use: Industrial/Commercial																	
Inventoried by: T. Feuerbacher																			
Sample Number	GPS Point	Tifton 85 Bermuda	Coastal Bermuda	Common Bermuda	Klein Grass	Old World Bluestem	Switch Grass	Wilman Love	Sideoats Grama	Indian Grass	Other Grasses	Forbs & Vines	Woody Species	Approved Invaders	Litter	Miss		Rock Water	
																BG	NPS		
51	70													WRW					
52	20													J					
53	99														X				
54	91		X																
55	23		X																
56	63											MSF							
57	39														X				
58	80		X																
59	55	X																	
60	26	X																	
61	81						X												
62	66						X												
63	86												LO						
64	31					X													
65	22													TH					
66	62					X													
67	43													J					
68	90		X																
69	37		X																
70	49										SBS								
71	44													J					
72	72														X				
73	60					X													
74	15					X													
75	35	X																	
76	93					X													
77	79	X																	
78	30													J					
79	36					X													
80	61					X													
81	89						X												
82	50														X				
83	96												PO						
84	34												PO						
85	2					X													
86	17												PO						
87	71					X													
88	11														X				
89	98						X												
90	7		X																
91	68												PO						
92	74		X																
93	47					X													
94	13		X																
95	41														X				
96	57		X																
97	75		X																
98	14		X																
99	8		X																
100	73		X																
TOTAL		5	15	0	0	16	8	0	0	0	1	2	11	29	13	0	0	0	
Estimated Ground Cover =		96.0%																	
J=Johnsongrass, WB=Willow Baccharis, ERW=Eastern Ragweed, GA=Green Ash, MES=Honey Mesquite, DB=Dewberry, BL=Black Locust, CE=Cedar Elm, PO= Post Oak, WRW=Western Ragweed, MSF=Maximillian Sunflower, LO=Live Oak, TH=Thistle, SBS=Silver Bluestem																			

GROUND COVER STANDARD

580.7-ac Bond Release Area

Species	Hits	Weighted Average
Tifton 85 Bermuda	5	11.1%
Coastal Bermuda	15	33.3%
Common Bermuda	0	0.0%
Klein Grass	0	0.0%
Old World Bluestem	16	35.6%
Switch Grass	8	17.8%
Wilman Love	0	0.0%
Sideoats Grama	0	0.0%
Indian Grass	0	0.0%
Other Grasses	1	2.2%
Total	45	100.0%

Percent Sodgrasses:	44.4%
Percent Bunchgrasses:	55.6%
% Weighted Sodgrass Standard:	42.2%
% Weighted Bunchgrass Standard:	50.0%
Total Weighted Cover Standard:	92.2%
Lowest Acceptable Value	83.0%

Appendix B: Statistical Calculations

Statistical Calculations for Vegetation Evaluation - Ground Cover

Study Area: 580.7-Acre Bond Release Area

Maximum Error (Cover)		
t with $\alpha=.05$:	1.662	99
No. of Pts.	100	
% grndcvr	96.0	
Std Error	1.96	
Max Error	3.4%	

Confidence Interval (Cover)		
t with $\alpha=.10$	1.290	99
No. of Pts.	100	
% grndcvr	96	
Std Error	1.96	
C.I. =	98.5	2.5